ASSIGNMENT 1

Textbook assignment: Chapter 1, “Synchros,” pages 1-1 through 1-78.

1-1. Which of the following terms accurately describes a synchro?

1. Position-sensing
2. Electromechanical
3. Rotary
4. Each of the above

1-2. What are the two general classifications of synchro systems?

1. Torque and load
2. Torque and control
3. Load and control
4. Load and lock

1-3. What is the difference in application between the two classifications of synchros?

1. Light versus heavy load
2. Mechanical versus electrical Output
3. Circular versus straight-line motion
4. High-frequency versus low-frequency operation

1-4. Which of the following types of synchro devices provides a mechanical output?

1. A control transformer
2. A torque receiver
3. A torque transmitter
4. A control transmitter

1-5. A 115-volt, 400-Hz torque transmitter with a diameter of 2.36 inches will have what military standard designation code?

1. 115 V-23CT6
2. 115 V-24TT4
3. 23TD4
4. 24TX4

1-6. A 3.5-inch diameter differential receiver will have what Navy prestandard designation code?

1. 35CR
2. 35TDR
3. 5D
4. 5DG

1-7. What does the arrow on a synchro schematic symbol indicate?

1. The direction of current flow
2. The direction of rotor movement
3. The angular position of the stator
4. The angular position of the rotor

1-8. What are the two major components of a synchro?

1. The rotor and the stator
2. The housing and the stator
3. The rotor and the shaft
4. The housing and the shaft

1-9. What type of rotor can be composed of a single winding or three Y-connected windings?

1. Salient-pole
2. Drum or wound
3. Fixed
4. "H"

1-10. How does the stator of a TX receive voltage?

1. By a physical connection with the rotor
2. By a magnetic coupling with another stator
3. By a magnetic coupling with the rotor
4. By a physical connection with a source

1-11. What part of a synchro provides a point for external connections?

1. The terminal board
2. The slip ring
3. The stator
4. The brush

1-12. Which of the following terms is defined as the amount of load a machine can turn?

1. Radian force
2. Load factor
3. Torque
4. Tension

1-13. Which of the following units should be used in measuring the amount of turning force of a synchro?

1. Ounces
2. Pounds
3. Foot-pounds
4. Ounce-inches

1-14. An overloaded synchro will probably exhibit which of the following conditions?

1. Overspeed
2. Oscillation
3. Excessive temperature
4. Noisy operation

1-15. A synchro receiver has which of the following characteristics that is NOT found in an ordinary transformer?

1. A primary that can rotate in relation to the secondary
2. A primary magnetically coupled to the secondary
3. A step-up turns ratio
4. An air core

1-16. When a synchro transmitter is in the zero-degree position, the rotor is aligned in what manner?

1. With winding S1
2. With winding S2
3. With winding S3
4. Between winding S1 and S2

1-17. Maximum voltage is induced in a stator winding of a synchro transmitter when the rotor and the stator winding have what angle between them?

1. 0 degrees
2. 30 degrees
3. 60 degrees
4. 90 degrees

1-18. Which of the following factors does NOT affect the amplitude of the voltage induced in a stator winding of a synchro transmitter?

1. The angular displacement between the rotor and stator
2. The amplitude of the primary voltage
3. The speed of data transmission
4. The turns ratio of the synchro

1-19. Damping is necessary for which of the following synchro devices?

1. Receiver
2. Transmitter
3. Control transformer
4. Differential transmitter

1-20. The primary purpose of damping is to reduce which of the following conditions in a synchro device?

1. Readings 180º out of phase
2. Overheating
3. Oscillating
4. Each of the above

1-21. What is the minimum number of synchro devices needed for a simple synchro transmission system?

1. One
2. Two
3. Three
4. Four

1-22. In a simple synchro system, what leads are connected to the source voltage?

1. R1 and R2
2. S1 and S2
3. S2 and S3
4. R1 and S1

1-23. When a synchro transmitter, and receiver are in correspondence, what is the relative value of the (a) current through the stators and (b) receiver torque?

1. (a) Maximum (b) maximum
2. (a) Maximum (b) minimum
3. (a) Minimum (b) minimum
4. (a) Minimum (b) maximum

1-24. What term applies to the angle through which a synchro transmitter rotor is rotated mechanically?

1. Lag
2. Lead
3. Gain
4. Signal

1-25. If a synchro receiver is required to rotate in a direction opposite to the rotation of the transmitter rotor, what leads should be reversed?

1. R1 and R2
2. S1 and S2
3. S2 and S3
4. S1 and S3

1-26. If a synchro receiver and transmitter are always 180 degrees out of phase with each other, what leads are reversed?

1. R1 and R2
2. S1 and S2
3. S2 and S3
4. S1 and S3

1-27. What type of synchro can accept two signals simultaneously and add or subtract?

1. Transmission
2. Differential
3. Automatic
4. Shiftless

1-28. What are the two types of synchro devices that will accept two inputs?

1. TR and TX
2. TR and TDX
3. TDR and TX
4. TDR and TDX

1-29. What types of synchro devices have (a) one electrical and one mechanical input and an electrical output; and (b) two electrical inputs and a mechanical outputs?

1. (a) TR (b) TX
2. (a) TX (b) TR
3. (a) TDX (b) TDR
4. (a) TDR (b) TDX

1-30. What determines whether a differential synchro device adds or subtracts its inputs?

1. The way it is connected in the system
2. The direction of rotor movement
3. The number of stator windings
4. The supply voltage polarity

1-31. In a TDX system, for the TR rotor to follow the TX rotor exactly, in what position must the TDX rotor be kept?

1. 0 degree position
2. 60 degree position
3. 120 degree position
4. 240 degree position

1-32. What is the angular position of a TR rotor when it is pointing to the S3 winding?

1. 0 degrees
2. 60 degrees
3. 120 degrees
4. 240 degrees

1-33. If a TDX system with standard synchro connections has the TX rotor at the 60-degree position and the TDX rotor at the 270-degree position, what is the position of the TR rotor?

1. 110 degrees
2. 150 degrees
3. 210 degrees
4. 250 degrees

1-34. For a TDX system to add its inputs rather than subtract them, what leads must be reversed between (a) the TX and TDX, and (b) the TR and TDX?

1. (a) S1 and S2 (b) R1 and R3
2. (a) S1 and S3 (b) R1 and R3
3. (a) S2 and S3 (b) R1 and R2
4. (a) S1 and S3 (b) R1 and R2

1-35. For a TDR system to add its inputs rather than subtract them, what leads must be reversed at the TDR?

1. S1 and S3
2. S1 and S2
3. R1 and R3
4. R1 and R2

1-36. If a TDR system is connected for addition and the TX rotor connected to the TDR rotor turns counterclockwise, in what direction will the TDR rotor field rotate?

1. In a direction determined by the other TX stator
2. In a direction determined by the other TX rotor
3. Counterclockwise
4. Clockwise

1-37. Which of the following types of synchros is used in a system requiring large amounts of power and high accuracy?

1. Torque
2. Control
3. Differential
4. Each of the above

1-38. What are the three types of control synchros?

1. TX, TR, CT
2. TX, CDX, CR
3. CX, CT, CR
4. CX, CT, CDX

1-39. The CX and CDX differ from the TX and TDX because the CX and CDX have which of the following characteristics?

1. Lower impedance windings
2. Higher impedance windings
3. Larger physical size
4. Smaller physical size

1-40. Which of the following is NOT a characteristic of the rotor of a control transformer (CT) rotor?

1. It is connected to a high-impedance load
2. It must be turned by an external force
3. It is connected to an ac source
4. It has a drum- or wound-type rotor

1-41. When a control transformer is at electrical zero, the rotor is perpendicular to what winding?

1. S1
2. S2
3. S3
4. R2

1-42. If a control transformer is held at electrical zero and the control transmitter is turned 90 degrees counterclockwise, what is (a) the amplitude of the induced voltage in the rotor of the control transformer, and (b) the phase relationship of this voltage and the excitation voltage to the control transmitter?

1. (a) Maximum (b) out-of-phase
2. (a) Maximum (b) in phase
3. (a) Minimum (b) out-of-phase
4. (a) Minimum (b) in phase

1-43. Which of the following terms applies to the output of a control transformer?

1. Mechanical movement
2. Deflection angle
3. Output voltage
4. Error signal

1-44. If the output of a control transformer is zero, what is the relationship of the rotors of the control transformer and the control transmitters?

1. In correlation
2. Out of correlation
3. In correspondence
4. Out of correspondence

1-45. Synchro capacitors are used to provide which of the following characteristics in a synchro system?

1. Improved accuracy
2. Reduced oscillations
3. Wider frequency response
4. Higher load-carrying capacity

1-46. Which of the following synchro devices uses a synchro capacitor?

1. TX
2. RX
3. TDR
4. CDX

1-47. What type of current is eliminated by synchro capacitors?

1. Loss
2. Rotor
3. Stator
4. Magnetizing Stator

1-48. In what configuration are synchro capacitors connected in a synchro circuit?

1. Wye, across the rotor windings
2. Delta, across the rotor windings
3. Wye, across the stator windings
4. Delta, across the stator windings

1-49. To maintain system accuracy, where are synchro capacitors physically placed in a synchro circuit?

1. Close to the TX or RX
2. Close to the TDX, CDX, or CT
3. Midway between the TX and CT
4. Far away from the TDR, CDX, or CT

1-50. Synchro systems that transmit data at two different speeds are referred to by which of the following terms?

1. Dual-speed
2. Two-speed
3. Twin-speed
4. Each of the above

1-51. Multispeed synchro systems have which of the following advantages over single-speed synchro systems?

1. Easier to troubleshoot and align
2. Fewer moving parts
3. Greater accuracy
4. All of the above

1-52. What does the gear ratio between the two transmitters in a dual-speed synchro system determine?

1. The direction of transmitter-rotation
2. The direction of receiver rotation
3. The speeds of transmission
4. The relative direction of rotation

1-53. Which of the following synchro systems, if any, should be used to transmit very large quantities?

1. Single-speed
2. Two-speed
3. Tri-speed
4. None of the above

1-54. Which of the following is a disadvantage of a double receiver as compared to two single receivers?

1. The entire unit must be replaced if one portion fails
2. It takes up much more space
3. It is much more costly
4. It is much heavier

1-55. The voltage used to prevent false synchronizations is known by what term?

1. Error voltage
2. Signal voltage
3. Source voltage
4. Stickoff voltage

1-56. What is the reference point for the alignment of all synchro units?

1. Mechanical zero
2. Electrical zero
3. Mechanical null
4. Electrical null

1-57. What is the most accurate method of aligning a synchro?

1. The dc voltmeter method
2. The ac voltmeter method
3. The synchro-tester method
4. The electric-lock method

1-58. During synchro alignment, what is the purpose of the coarse setting?

1. To ensure a setting of zero degrees rather than 180 degrees
2. To prevent the voltmeter from being overloaded
3. To keep the synchro device from overheating
4. To correct the fine setting

1-59. If a synchro receiver is properly zeroed, when do the stator windings have electrical zero voltages?

1. When the rotor is moving
2. When the rotor is stopped
3. When the rotor is at 270 degrees
4. When the rotor is at its reference position

1-60. When a 115-volt synchro transmitter is set on its coarse-zero position, approximately what voltage should be read on a voltmeter?

1. 15 volts
2. 26 volts
3. 37 volts
4. 193 volts

1-61. When a 115-volt source is used during the alignment of a differential synchro, what is the maximum time the circuit can be energized without causing damage to the synchro?

1. 1 minute
2. 2 minutes
3. 15 minutes
4. 30 minutes

1-62. After a control transformer has been zeroed and clamped down, what is the final step in the zeroing procedure?

1. Replace the fuses
2. Turn it to 270 degrees
3. Recheck the zero voltage reading
4. Disconnect all wires to the control transformer

1-63. The output voltage of a control transformer on electrical zero is which of the following relative values?

1. Equal to the supply voltage
2. Half the supply voltage
3. Maximum
4. Minimum

1-64. When a tri-speed synchro system is being zeroed, which synchro should be zeroed first?

1. Coarse
2. Medium
3. Largest
4. Fine

1-65. What method of zeroing a synchro is the fastest but NOT the most accurate?

1. The dc voltmeter method
2. The ac voltmeter method
3. The synchro-tester method
4. The electrical-lock method

1-66. The electrical-lock method of zeroing a synchro requires accessible leads and which of the following conditions?

1. A rotor free to turn
2. A stator free to turn
3. A supply voltage to the stators
4. A zero-volt potential between S1 and S2

1-67. A synchro is zeroed by the use of a synchro tester. After it is zeroed, the S1 and S3 leads are shorted together, and the synchro tester dial moves. What does this indicate?

1. The synchro is zeroed correctly
2. The synchro is not zeroed correctly
3. The supply voltage is too low
4. The supply voltage is too high

1-68. If you find that a synchro has bad bearings, which of the following actions should you take?

1. Replace the bearing
2. Lubricate the synchro
3. Replace the synchro
4. Continue to use it

1-69. Which of the following troubles is common in newly installed synchro systems?

1. Dirty brushes
2. Improper wiring
3. Worn slip rings
4. Shorted synchro windings

1-70. What type of indicating device is usually installed in the stator circuit of a torque synchro system?

1. A voltmeter indicator
2. An ohmmeter indicator
3. An overload indicator
4. A blown-fuse indicator

1-71. A synchro system with four receivers is malfunctioning. All of the receivers have incorrect readings. Which of the following is/are the most likely cause(s) of the trouble?

1. Damper failure
2. The transmitter
3. One of the receivers
4. All of the receivers

1-72. An ac voltmeter is connected between windings S1 and S3 of a synchro transmitter. Which of the following rotor positions should give a zero voltage reading?

1. 180º
2. 240º
3. 300º
4. 330º

1-73. When a synchro tester is used in place of a synchro transmitter, which of the following precautions will help to keep the tester from being overloaded?

1. Use a 26-volt supply only
2. Use a 115-volt supply only
3. Use only one syncho receiver
4. Use at least three synchro receivers